

complaints from nearby residents rather than done proactively and routinely, and state agencies or engineering firms are called in to do the job. Some municipalities have implemented self-monitoring, but that entails the usual problems with self-policing: suspicions that the reports are slanted to make companies “look good,” equipment that is tampered with, and a dearth of comprehensive reporting. ((14:20))

The same report did endorse the concept of performance standards, and so contained recommendations for improvement. These included having communities conduct a periodic review of their performance standards to ensure that they reflect current regulations and technology, aided by a special standards commission and by regular contact with relevant federal and state agencies, such as the DEM. The report suggested addressing a broader range of possible impacts, such as soil erosion, electrical interference, and stormwater runoff.

The report also recommended a phase-out of the old use lists, and their replacement with criteria and development standards that were more compatible in principle with performance standards. Among these criteria were employment density, size of buildings, type of industrial process, type of machinery, and intensity of land use. The development standards included setbacks, buffers, and landscaping. ((14:21))

## **02-06-02: Hazard Mitigation**

Rhode Island is vulnerable to coastal and riverine flooding, high winds, ice, and coastal erosion. These are known as natural hazards. Under extreme conditions, such as hurricanes and nor'easters, they can become natural *disasters* with severe impacts: deaths and injuries, damage to property and infrastructure, factory and business closings, and a prolonged disruption of community life.

Proper planning for natural hazard events can help prevent their escalation into disasters by reducing such losses and limiting environmental impacts. Land use regulation, as a sustained action in support of public welfare, can be part of a hazard mitigation strategy. Parcels of industrial land prone to natural hazard events, such as floodplains and areas of coastal erosion, can be identified and avoided when siting industry. Such areas may be better kept as open space if they presently are undeveloped. Where this is obviously not practical, uses can be limited to those requiring location in the hazard area – for example, marine-related industries sited along the waterfront. In these instances, appropriate mitigating measures can be taken according to the building code and best engineering practices.

Fortunately, Rhode Island is no stranger to hazard mitigation. Several municipalities — including Charlestown, Narragansett, Providence, and Pawtucket — have already identified their own natural hazards and written strategies for mitigation to be implemented through their Comprehensive Plans. There is a State Hazard Mitigation Committee that includes among others the R.I. Emergency Management Agency (RIEMA), the State Building Code Commissioner, the State Fire Marshal, and the University of Rhode Island.

Warwick, Pawtucket, and Providence are also part of the Federal Emergency Management Agency's (FEMA's) "Project Impact" program, the intent of which is to make communities "disaster resistant" and able to respond quickly and effectively to natural hazard events. Part of Warwick's involvement has been to use its Geographic Information System (GIS) capabilities to map flood hazards citywide, identify vulnerable structures, and plan mitigation. The city has also worked with Home Depot to develop a community training and education program to retrofit and floodproof houses. ((105))

In addition to these local efforts, a statewide hazard mitigation plan is under development by RIEMA according to federal guidelines. Elements of the State Guide Plan are also being revised to acknowledge the importance of hazard mitigation and set forth appropriate policies. In this report, for example, the Industrial Site Inventory (Appendix B) lists flood hazard concerns and other "environmental" or "physiographic" constraints to new construction, while the land use goals at the end of this part and the policies at the end of Part 212-03 include hazard mitigation.

## **02-07: Commingling and Clustering Industries**

Commingling works best with related industries. One company may provide materials that are essential to the manufacturing of a product of another company, or be the second company's research and development arm. A third company might be the trucking outfit that links the first two companies with markets in nearby metropolitan areas. A fourth company might provide computer consulting or inventory management. The possibilities for cooperation among these firms could manifest themselves in business incubators if start-up companies are involved, or in specialized "technology parks" or business parks where one type of good or service is produced. Cooperation may extend into training, technology transfer, and marketing.

*Industry clustering* takes commingling a step further. Clustering is more specialized in that it involves cooperation among would-be competitors within a single industry. Clusters may take in only one Standard Industrial Classification (SIC) group, or can be spread more broadly, depending on the nature of the industry. The production process, or means of providing their service, will govern the cluster's development.

Factors supporting clustering include the capacity for research and development, compatible workforce skills, proximity to suppliers, access to specialized services, intensity of networking, social infrastructure, entrepreneurial energy, and a shared vision. ((15:24)) Clustering can enable participants to achieve economies of scale essential to production by aggregating purchasing power for raw materials, rationalizing the manufacturing process, and marketing products in common.

The R.I. Economic Policy Council recently identified nine key industrial sectors that might be expected to form clusters easily and distinctly benefit from them. These industries included “mature” sectors that have been losing jobs lately as well as newer, more “high-tech” examples, in manufacturing as well as services. Jewelry (SIC 391, 395, 396) and boat building (SIC 3732) were included; also electronics and instruments (SIC 357, 362, 366, 367, 369, 38), software (SIC 737, 8711), tourism (SIC 45, 58, 70, 79, 84), precision metalworking (SIC 349, 354, 355, 356, 359), seafood products (SIC 0273, 091, 0921, 2091, 2092, 5146), financial services (SIC 60, 63, 67), and biomedical industries (scattered SIC groups, taking in manufacturing, research, and service provision). ((15:23-24))

Interestingly, there are firms that do not cluster for the same reasons the industries described above do, but form associations with nearby research institutions — resulting in what the Economic Policy Council calls *incubation clusters*. These too can result in considerable economic activity and industry growth. The medical instruments industry in Minneapolis, for example, grew out of spinoffs from a manufacturer of cardiac pacemakers and the University of Minnesota Medical School. ((15:23))

Most Rhode Islanders are familiar with the Jewelry District in Providence and the concentration of recreational boat building in the East Bay. As in any cluster scenario, the proximity of leading actors and players to each other is critical for the desired synergy to occur. If industrial land can be properly assembled where clusters are developing, and development of the participating industries can be focused there rather than scattered around the state, there will be an enormous benefit to Rhode Island. This will not only be the economic benefit to the companies resulting from their clusters, but the benefit of more proactive land use management than ever before.

It is while assembling such industrial parcels for an anticipated industrial, business, or technology park that developers need to ask themselves the following questions:

- Will the park’s location and configuration lend themselves to commingling and clustering? If an incubation cluster is anticipated, will the park be close enough to likely business partners, research centers, or product markets?
- Are the target industries looking to expand their operations in the area, so that they will be interested in locating in the park?
- Can the park be supported in the local economy, considering prevailing rents, the cost of energy, and the character and intensity of competition?
- Particularly in the case of a specialized facility such as a research park, can the intended use be sustained, even during economic downturns?
- Will the terms of the park covenant be consistent with zoning and environmental regulations?

This process requires the usual market study, but also consultation with state and local authorities as well as prospective clients. Planners may contribute during the earliest stages of development through site plan review and by assisting developers with the park covenants to ensure consistency with state and local ordinances. These contacts should be maintained after the park is built, occupied, and running successfully. Improvements to the park will be required periodically, whether in response to the changing needs of the tenants or to new regulations. ((11))

## **02-07-01: Commingling Inputs and Outputs: the Eco-industrial Park**

As the concept of sustainable development matures, it will probably become feasible to commingle industries not just around a single product or service, but to optimize production efficiency and eliminate, or at least greatly reduce, industrial waste. This is the principle behind the *eco-industrial park*.

An eco-industrial park is a true sustainable development system. Firms in the park are encouraged to manage the park's environment and energy resources cooperatively, with components of the waste stream of one tenant being used as raw material for another. "Probably the best example of an eco-industrial park," wrote commentator David Salvesen in 1996, "lies along the coast of Denmark, in an industrial region called Kalundborg." The park, he explained, involved a web of waste and energy exchanges between and among the city, a refinery, a power plant, a fish farm, a pharmaceutical manufacturer, and a wallboard maker.

The exchange works something like this: the power company pipes residual steam to the refinery and, in exchange, receives gas (which used to be flared as waste). The power plant burns the refinery gas to generate electricity and steam. It also sends excess steam to a fish farm, the city, and a biotechnology plant that makes pharmaceuticals. Sludge from the fish farm and pharmaceutical processes becomes fertilizer for nearby farms. Surplus yeast from the biotechnology plant's production of insulin is shipped to farmers for pig food. Further, a cement company uses fly ash from the power plant, while gypsum produced by the power plant's desulfurization process goes to a company that produces gypsum wallboard. Finally, sulfur generated by the refinery's desulfurization process is used by a sulfuric acid manufacturer. ((16))

Salvesen noted that these different enterprises came together voluntarily to help reduce waste treatment and disposal costs. They soon realized further savings from the efficiencies of planned and organized material and energy exchanges.

A broad-based acceptance of sustainable development is needed for business, civic, and government leaders to embrace eco-industrial parks. The best way to instill support may be to promote eco-industrial parks as a means of reducing waste streams that are expensive to treat. The concept could be introduced at a public workshop on sustainable development, beginning with the basics, showing examples already prevalent in Rhode Island (e.g., the recycling of trash, and rehabilitated and reused mill

buildings), and moving on to more advanced concepts such as coordinating inputs and outputs in eco-industrial parks. The state's business community should be afforded an opportunity to learn from the experiences of colleagues from other parts of the country or world who have experimented successfully with eco-industrial parks. ((17))

## **02-08: Business Incubators**

A business incubator, true to its name, will nourish young enterprises until they are mature enough to make it on their own — whereupon they will “graduate” and set up shop elsewhere. Nourishment comes from sharing building space, equipment, and even clerical staff, with significant cost savings realized from pooling resources. Money is “freed” for pursuits other than administrative costs in this cooperative environment. As development capital typically is a problem for new and strongly entrepreneurial businesses, a business incubator could prove crucial to their survival.

Incubators may be situated on university campuses, in industrial parks, in urban industrial centers, or in inner-city neighborhoods. Typically, a minimum of 15,000 sq. ft. of usable space is needed to permit some expansion as the incubator tenants mature, and to achieve economies of scale in administrative cost. ((18:25)) Incubators have the potential to revive economically depressed areas by promoting local and minority-owned businesses and by generating new jobs in new industries. Volunteered consulting services, export promotion, and opportunities for venture capitalization and technology transfer can enhance the incubator's business environment.

One of the most extensive studies of incubators dates back to 1988 and the work of Candace Campbell and her associates. While touting incubators as “a logical and efficient approach to support new enterprises,” they warned about placing too much reliance on incubators for *job creation* in such firms. ((19:3)) Employment was higher in incubator firms that sold to large, local corporations and governments and had developed substantial market experience — and therefore were ready to leave the incubator — than in the businesses that were just starting and were still rather dependent on the incubator environment. ((19:6)) When significant job generation does come to an incubator firm, it is usually after the firm has left the incubator and established itself on the outside. In other words, it does not happen immediately. ((20:14))

What business incubators do best, then, is to help start-ups survive until they are ready to stand on their own. From the experience of the incubator, start-ups can also learn the value of inter- and intra-industry collaboration, which seems to be essential to the development of the New Economy.

David N. Allen and Janet Hendrickson-Smith of Pennsylvania State University urge “a different calculus from just counting jobs” to measure an incubator's success. They suggest looking at certain “incubator milestones” instead:

- Completion of initial tenant space.
- Arrangement of shared office services.

- Reaching the occupancy level necessary for the incubator to break even financially.
- Creation of a responsive business assistance network.
- Development of interfirm trade relations.
- Graduation of the incubator's first tenant.
- Admission of primarily new ventures, not relocated, previously established firms.
- Expansion into new, larger quarters to accommodate new or expanding tenants. ((18:29-30))

These milestones, they said, “do not always occur in a sequential order, but for the incubator to make a contribution, each milestone must be eventually passed.” ((18:30)) Sharing office services and networking are particularly important in fostering successful industry clusters and joint ventures. The hoped-for job generation should follow.

The relatively small size required for business incubators makes them ideally suited to renovated buildings in urban industrial areas, such as Rhode Island's old mills. Allen and Hendrickson-Smith found that in nine of the twelve cases they studied, the initial idea for the incubator came out of “the desire to do something productive” with “an old building in a state of moderate disrepair.” ((18:7)) On the other hand, the costs of renovation and maintenance of such a building should not be so high that the owners and managers of the incubator are forced to charge high rents or to reduce the services they provide. If rents become prohibitive for start-up businesses, the incubator function will suffer, and the incubator may actually cease being an incubator — becoming just another office park, where management is more concerned with real estate than with helping start-ups grow.

Incubators obviously have to be planned carefully to do the job intended. Tenancy must be managed to encourage firms to leave the incubator once their businesses have grown and matured, so that space will become available for new companies. Raising rents after so many years of tenancy is one way of doing this. Fortunately, experience has shown that most tenants understand the purpose of business incubators and accept the notion that eventually they have to move on for the incubator to remain an incubator. ((18:17))

Perhaps one of the most important things by which to gauge incubator performance is its effect on the local business climate. Campbell *et al.* discovered that new companies often won greater acceptance from lenders, investors, and real estate agents by participating in an incubator than by going it alone. The risks in bankrolling research, development, and other phases of start-up, and in providing office and industrial space for fledgling enterprises, seemed fewer when backed by the incubator. The firms gained legitimacy from the incubator. ((19:5))

In 1998, the R.I. General Assembly authorized the establishment of an “urban business incubator” to be located in one of the state's enterprise zones. It was described as “a multi-tenant, mixed-use facility serving companies in a variety of industries including, but not limited to: services, distribution, light manufacturing, or

technology-based businesses.” A “range of services” would be shared among the tenants, such as “flexible leases, shared office equipment, use of common areas such as conference rooms,” and “easily accessible business management, training, financial, legal, accounting, and marketing services” would be directly or indirectly provided. The incubator was to be run as a tax-exempt, non-business corporation. ((89)) In 1999, a group called Urban Ventures established the incubator in South Providence. This is described in detail in Part 212-06, “Implementation Mechanisms,” pp. 6.7-6.8.

Experiments with business incubators in Rhode Island bear watching. If the motivating force in the New Economy is the entrepreneur, the services provided to the entrepreneur in an incubator could be key to future economic development.

## **02-09: Summarized Land Use Goals**

From this review of needs and options, and from Rhode Island’s experience, an industrial land use plan must encourage the public and private sectors to:

1. *Place sufficient land in reserve to sustain economic growth without compromising the state’s quality of life.* Arriving at an appropriate number of acres for this purpose involves forecasting economic activity to the year 2020 and the demands on industrial land this activity will make. The forecast must then be compared with our current inventory of industrial-zoned land. We recommend following the lead of *Land Use 2010* and the original *Industrial Land Use Plan* and reserving land now in industrial use, land that is currently vacant and considered prime, and an additional 8,000 acres from the inventory of vacant but non-prime land, for industrial use in the future. This can be accomplished by discouraging uses incompatible with industry on land that is presently zoned industrial.

We also should not only consider the quantity of industrial land when we set our goals, but also the quality. We must recognize the need for parcels that are of sufficient size and appropriate configuration to be marketed to industry, as well as serviced with utilities. Keeping the industrial land inventory current is a prerequisite. It is the best means we have of monitoring the use of industrial land and its availability for the future. It is also an important tool for working with the local communities to “match the plant to the land,” reuse underutilized industrial properties, track changes in employment densities as the New Economy takes hold, and prevent sprawl or conversion of greenfields.

Where possible, land reconfiguration to suit the needs of modern industry should be encouraged wherever it leads to more efficient use of the limited industrial land resource, in harmony with the surrounding environment. Natural hazards should be avoided to the extent possible, although it should be recognized that some industries may require a location in a hazard-prone area. In such instances, industrial development or redevelopment must comply with building code

standards and appropriate mitigating measures. In addition, as development and reconfiguration occur, certain environmental concerns such as stormwater runoff should also be recognized as natural hazard issues, insofar as they have the potential for threatening life and property with flooding, structural damage, etc.

2. *Employ “mixed use” as a strategy for industrial land use wherever economically and environmentally feasible*, using industrial performance standards to commingle related industries while at the same time protecting neighboring uses.
3. *Assure to the maximum extent possible the appropriate use of prime industrial land* by matching an industry’s needs to available parcels (what we discussed above as “matching the plant to the land”). An automobile assembly plant, for example, will require much more than a software development firm.
4. *Promote sustainable development*. Waste control and the appropriate reuse of older industrial facilities can be the cornerstones of a much broader sustainable development program. Rhode Island’s recycling program and mill building rehab legislation are excellent first steps; combining elements of both in eco-industrial parks is an exciting possibility that needs to be explored.

We expect the extension of infrastructure to continue to be necessary to provide construction-ready sites for industrial expansion. However, such improvements should be done judiciously and in full accordance with local comprehensive plans so that development can be reasonably guided and controlled.

5. *Encourage business partnerships that can nurture growing companies with much potential*, strategically locating them wherever the natural tendency of related industries to cluster, network, and synergize is likely to occur.